

WHAT IS CLAIMED IS:

1. A pipe coupling socket having a piping junction at one end thereof and a plug inlet at the other end, in which a piping passage and the plug inlet are internally connected by means of a through passage of a built-in ball valve, comprising:

5 a socket body having therein a valve chamber, one end of which communicates with the piping passage and the other end of which communicates with the plug inlet, the ball valve located for rotation in the valve chamber, and a valve control sleeve which is fitted on the outer periphery of the socket body and which advances to open the ball valve and retreats to close the ball valve;

10 a locking element which is supported on the distal end portion of the socket body for movement in the centripetal and centrifugal directions and engages an engaging groove formed on the outer periphery of a plug inserted in the plug inlet, thereby locking the plug;

15 a plug connecting sleeve which is fitted on the distal-side outer periphery of the socket body and which advances to move the locking element to the centripetal direction, thereby locking the plug, and retreats to allow the locking element to move to the centrifugal direction, thereby unlocking the plug;

20 first lock means which prevents the valve control sleeve from advancing when the plug connecting sleeve

is situated in a retreated position; and second lock means which prevents the retreat of the plug connecting sleeve and the advance of the valve control sleeve when the plug connecting sleeve and the
5 valve control sleeve are situated in an advanced position and a retreated position, respectively, and third lock means which prevents the retreat of the plug connecting sleeve and the valve control sleeve when the plug connecting sleeve and the valve control sleeve are situated in their respective advanced positions.
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2. A pipe coupling socket according to claim 1, wherein the plug connecting sleeve is prevented from rotating in the circumferential direction and allowed to advance when in the retreated position, and is
15 allowed to rotate in the circumferential direction to be prevented from retreating when in the advanced position, the rear end of the plug connecting sleeve having notches formed at given spaces in the circumferential direction, the notches being fitted
20 with first lock balls for movement in the centripetal and centrifugal directions, the first lock balls moving back and forth as the plug connecting sleeve moves back and forth and moving in the circumferential direction with rotation; the outer peripheral surface of the
25 socket body is formed having fitting recesses circumferentially fitted with the first lock balls of the plug connecting sleeve in the advanced position and

having a depth for movement to the centripetal direction, the first lock balls being situated on the centripetal side when the first lock balls are fitted in the fitting recesses, the first lock balls being
5 situated on the centrifugal side when the plug connecting sleeve is in the retreated position and when the plug connecting sleeve is situated in the advanced position and rotated so that the first lock balls are disengaged from the fitting recesses, the valve control
10 sleeve in the retreated position being prevented from advancing when the plug connecting sleeve is in the retreated position in this state, and the valve control sleeve and the plug contacting sleeve being prevented from retreating when the plug connecting sleeve and the
15 valve control sleeve are in the advanced position; the inner peripheral surface of the valve control sleeve has, on the distal end side thereof, a convex portion which extends in the circumferential direction and has first retaining step portions which engage the first
20 lock balls when the first lock balls are on the centrifugal side with the plug connecting sleeve in the advanced position, the convex portion is formed having moving grooves in positions corresponding to the fitting recesses in the outer peripheral surface of the socket body, depending on the distance covered by the
25 movement of the plug connecting sleeve, the first lock balls in the centrifugal side being movable in

the moving grooves, the moving grooves having, at the bottom thereof, second retaining step portions to which the first lock balls are anchored when the plug connecting sleeve is in the retreated position;

5 the convex portion is formed further having a first lock ball engaging groove which extends in the circumferential direction behind the moving grooves and is engaged by the first lock balls when first lock balls are on the centrifugal side; the first lock balls

10 on the centrifugal side and the second retaining step portions at the bottom of the moving grooves of the valve control sleeve constitute the first lock means; the first lock balls on the centrifugal side and the first retaining step portions of the valve control

15 sleeve constitute the second lock means; the first lock balls on the centrifugal side and the first lock ball engaging groove of the valve control sleeve constitute the third lock means; and the effect of locking by the first, second, and third lock means is removed when the first lock balls are fitted in the fitting recesses in

20 the outer peripheral surface of the socket body and situated on the centripetal side.

3. A pipe coupling socket according to claim 1, wherein the distal end portion of the socket body is fitted with a plurality of second lock balls which are arranged in the circumferential direction behind the locking element for movement in the centripetal and

centrifugal directions, the socket body is fitted with
a first collar for movement, the first collar in an
advanced position supporting and situating the second
lock balls on the centrifugal side in a manner such
5 that a part of each second lock ball projects from the
outer peripheral surface of the socket body and
retreating to release the second lock balls from the
support, thereby allowing the second lock balls to sink
into the socket body, the first collar being urged in
10 the advancing direction by means of a spring so that
the first collar retreats as a plug is inserted
therein; the plug connecting sleeve has, on the distal
end side of the inner peripheral surface thereof,
a plug unlocking recess which extends in the
15 circumferential direction and allows the locking
element to move to the centrifugal direction, the plug
unlocking recess being followed in the circumferential
direction by a taper step portion, which presses and
moves the locking element to the centripetal direction,
20 and a plug lock projection, which holds down moved to
the centripetal direction, the plug lock projection
being followed in the circumferential direction by a
second lock ball engaging groove in which the second
lock balls are fitted; the plug unlocking recess is
25 situated in the position of the locking element and is
allowed to move to the centrifugal direction of the
locking element when the second lock balls are on

the centrifugal side with the plug connecting sleeve in the retreated position, the second lock balls engaging the second lock ball engaging groove, thereby preventing the advance of the plug connecting sleeve;

5 and the locking element moved to the centrifugal direction in the process of plug insertion engages a step portion at the bottom of the plug unlocking recess of the plug connecting sleeve so that the plug connecting sleeve can advance when the first collar retreats to allow the second lock balls to move to the centripetal direction and be disengaged from the second lock ball engaging groove as the plug is inserted further.

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4. A pipe coupling socket according to claim 2,
15 wherein the distal end portion of the socket body is fitted with a plurality of second lock balls which are arranged in the circumferential direction behind the locking element for movement in the centripetal and centrifugal directions, the socket body is fitted with
20 a first collar for movement, the first collar in an advanced position supporting and situating the second lock balls on the centrifugal side in a manner such that a part of each second lock ball projects from the outer peripheral surface of the socket body and
25 retreating to release the second lock balls from the support, thereby allowing the second lock balls to sink into the socket body, the first collar being urged in

the advancing direction by means of a spring so that
the first collar retreats as a plug is inserted
therein; the plug connecting sleeve has, on the distal
end side of the inner peripheral surface thereof,
5 a plug unlocking recess which extends in the
circumferential direction and allows the locking
element to move to the centrifugal direction, the plug
unlocking recess being followed in the circumferential
direction by a taper step portion, which presses and
moves the locking element to the centripetal direction,
10 and a plug lock projection, which holds down moved to
the centripetal direction, the plug lock projection
being followed in the circumferential direction by a
second lock ball engaging groove in which the second
lock balls are fitted; the plug unlocking recess is
15 situated in the position of the locking element and is
allowed to move to the centrifugal direction of the
locking element when the second lock balls are on the
centrifugal side with the plug connecting sleeve in the
retreated position, the second lock balls engaging the
second lock ball engaging groove, thereby preventing
20 the advance of the plug connecting sleeve; and the
locking element moved to the centrifugal direction in
the process of plug insertion engages a step portion at
25 the bottom of the plug unlocking recess of the plug
connecting sleeve so that the plug connecting sleeve
can advance when the first collar retreats to allow

the second lock balls to move to the centripetal direction and be disengaged from the second lock ball engaging groove as the plug is inserted further.

5. A pipe coupling socket according to claim 1,
wherein the respective openings of the piping passage
of the piping junction and the plug inlet, which open
on the valve chamber side of the socket body, are
provided individually with annular rubber seal valve-
seats which coaxially face each other across the
through passage of the ball valve in an open position
and are elastically pressed to the outer peripheral
wall of the ball valve, the openings being further
provided individually with stoppers which prevent the
annular rubber seal valve-seats from being pressed to
the ball valve under an internal fluid pressure.
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6. A pipe coupling socket according to claim 2,
wherein the respective openings of the piping passage
of the piping junction and the plug inlet, which open
on the valve chamber side of the socket body, are
provided individually with annular rubber seal valve-
seats which coaxially face each other across the
through passage of the ball valve in an open position
and are elastically pressed to the outer peripheral
wall of the ball valve, the openings being further
provided individually with stoppers which prevent
the annular rubber seal valve-seats from being pressed
to the ball valve under an internal fluid pressure.
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7. A pipe coupling socket according to claim 3,
wherein the respective openings of the piping passage
of the piping junction and the plug inlet, which open
on the valve chamber side of the socket body, are
5 provided individually with annular rubber seal valve-
seats which coaxially face each other across the
through passage of the ball valve in an open position
and are elastically pressed to the outer peripheral
wall of the ball valve, the openings being further
10 provided individually with stoppers which prevent
the annular rubber seal valve-seats from being pressed
to the ball valve under an internal fluid pressure.

8. A pipe coupling socket according to claim 4,
wherein the respective openings of the piping passage
15 of the piping junction and the plug inlet, which open
on the valve chamber side of the socket body, are
provided individually with annular rubber seal valve-
seats which coaxially face each other across the
through passage of the ball valve in an open position
20 and are elastically pressed to the outer peripheral
wall of the ball valve, the openings being further
provided individually with stoppers which prevent the
annular rubber seal valve-seats from being pressed to
the ball valve under an internal fluid pressure.